National Institute of Environmental Health Sciences

Why is tick-borne encephalitis increasing? A review of the key factors causing the increasing incidence of human TBE in Sweden

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Abstract:

The highest annual incidence of human tick-borne encephalitis (TBE) in Sweden ever recorded by the Swedish Institute for Communicable Disease Control (SMI) occurred last year, 2011. The number of TBE cases recorded during 2012 up to 6th August 2012 indicates that the incidence for 2012 could exceed that of 2011. In this review of the ecology and epidemiology of TBE in Sweden our main aim is to analyse the possible reasons behind the gradually increasing incidence of human TBE during the last 20 years. The main TBE virus (TBEV) vector to humans in Sweden is the nymphal stage of the common tick Ixodes ricinus. The main mode of transmission and maintenance of TBEV in the tick population is considered to be when infective nymphs co-feed with uninfected but infectible larvae on rodents. In most locations the roe deer, Capreolus capreolus is the main host for the reproducing adult I. ricinus ticks. The high number of roe deer for more than three decades has resulted in a very large tick population. Deer numbers have, however, gradually declined from the early 1990s to the present. This decline in roe deer numbers most likely made the populations of small rodents, which are reservoir-competent for TBEV, gradually more important as hosts for the immature ticks. Consequently, the abundance of TBEV-infected ticks has increased. Two harsh winters in 2009-2011 caused a more abrupt decline in roe deer numbers. This likely forced a substantial proportion of the "host-seeking" ticks to feed on bank voles (Myodes glareolus), which at that time suddenly had become very numerous, rather than on roe deer. Thus, the bank vole population peak in 2010 most likely caused many tick larvae to feed on reservoir-competent rodents. This presumably resulted in increased transmission of TBEV among ticks and therefore increased the density of infected ticks the following year. The unusually warm, humid weather and the prolonged vegetation period in 2011 permitted nymphs and adult ticks to quest for hosts nearly all days of that year. These weather conditions stimulated many people to spend time outdoors in areas where they were at risk of being attacked by infective nymphs. This resulted in at least 284 human cases of overt TBE. The tick season of 2012 also started early with an exceptionally warm March. The abundance of TBEV-infective "hungry" ticks was presumably still relatively high. Precipitation during June and July was rich and will lead to a "good mushroom season". These factors together are likely to result in a TBE incidence of 2012 similar to or higher than that of 2011.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3439267

Resource Description

Exposure : ☑

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Meteorological Factors, Precipitation, Temperature

Temperature: Fluctuations

Geographic Feature: ☑

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : Sweden

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Tick-borne Disease

Tick-borne Disease: Tick-borne Encephalitis

Resource Type: ☑

format or standard characteristic of resource

Review

Timescale: ☑

time period studied

Time Scale Unspecified